

## **REMARKS**

Applicants have carefully reviewed the Final Office Action dated September 2, 2010 (hereinafter the “Final Office Action”). Applicants gratefully acknowledge the indication that claims 19-29 and 31-34 stand allowed. Claims 1-18 stand rejected. Applicants respectfully request reconsideration of the rejection of claims 1-18 in light of the remarks presented below.

### **Telephonic Interview**

Applicants thank Examiner Jiping Lu for her willingness to hold an after-final interview for this application and appreciate her time and efforts on this case. During the interview that took place on October 13, 2010, the rejection was discussed with Applicants’ representative, Jeffrey T.G. Kelsey. No agreement was reached, but the Examiner agreed to reconsider Applicants’ arguments if presented in greater detail as part of a response.

Applicants have prepared these Remarks in order to present their detail arguments as requested by the Examiner. If, after considering these Remarks, the Examiner has any questions or would like to discuss any aspect of this case, Applicants would greatly appreciate and welcome the opportunity to address those questions directly in a telephone interview to expedite the prosecution of this application for all concerned.

### **Rejections under 35 U.S.C. § 103(a)**

Claims 1-18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over .S. Patent No. 3,584,850 issued to Brandvold (hereinafter “Brandvold”) in view of U.S. Patent No. 5,413,476 issued to Baukal, Jr. et al. (hereinafter “Baukal”).

#### **Re: claims 1-7, 9-12, and 14-18**

Applicants respectfully traverse the rejection of claims 1-7, 9-12, and 14-18 for at least the following reasons:

- (i) The rejection is based on a flawed analysis of the scope and content of the prior art; and
- (ii) The references teach away from the proposed modification.

- (i) *The rejection is based on a flawed analysis of the scope and content of the prior art.*

On pages 2-4 of the Final Office Action, the rejection stated that

Brandvold discloses a mineral processing kiln 14 having an inclined rotary shell (a "vessel") 14c. Col. 4, l.73-col. 5, l.5; col. 5 ll. 60-67; fig. 1. Brandvold additionally discloses introducing combustion air and combustible fuel through a lower end 14b of the rotary shell 14c Col. 6, ll. 8-19 and generating a flame at the lower end of the rotary vessel (col. 5, lines 17-19, fig. 1). Brandvold additionally discloses introducing additional air through tuyeres 24e (disposed in an "opening") in a wall of the rotary shell 14c at a location downstream, relative to a kiln gas stream, of the flame and between the lower end of the rotary vessel 14b and an upper end of the rotary shell 14a. Brandvold's tuyeres 24e are arranged to spiral the incoming cooling air to rapidly mix it with the heating fluid. Col. 6, ll. 71-75. Brandvold does not disclose any particular stoichiometric condition of the fuel and air mixture supplied to heating means, nor does Brandvold disclose that the air introduced at tuyeres 24e is used for additional combustion. Baukal teaches a method for reducing NOx levels of conventional burners, such as those used in rotary kilns, by staging combustion reactions. Col. 1, ll. 43-46; col. 2, ll. 45-50. Baukal stages the combustion reactions by providing a burner 1 supplied with oxidant gas 5 and fuel 7 in the wall of a combustion volume or furnace. Baukal then introduces a second oxygen containing gas 15 into a flame 13 via conduit 17 Col. 4, l. 51-col. 5, l. 3. . . . The subject matter of claim 1 involves no more than the application of Baukal's known technique to Brandvold's known device in order to achieve the predictable result of reducing NOx emissions and therefore would have been obvious to one having ordinary skill in the art.

(emphasis added). Applicants respectfully traverse the rejection because the subject matter of the claims involves much more than the mere application of Baukal's known technique to Brandvold's known device. Contrary to the rejection's suggestion, neither reference teaches "introducing additional combustion air through an opening in a wall of the rotary vessel at a location downstream, relative to a kiln gas stream, of the flame and between the lower end of the rotary vessel and the upper end of the rotary vessel" as required by the claims. As such, the rejection is based on a flawed analysis of the scope and content of Brandvold and Baukal and should be withdrawn.

The analysis required under 35 U.S.C. § 103(a) must be resolved on the basis of the factual inquiries outlined in *Graham v. John Deere, Co.*, 383 U.S. 1, 148 USPQ 459 (1966); see

*KSR v. Teleflex*, 127 S.Ct. at 1740. The *Graham* Court stated that as part of any analysis under Section 103,

the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined.

148 USPQ at 467. The analysis of obviousness therefore requires an inquiry into the scope and content of the prior art and, more particularly, an inquiry into whether the prior art discloses all of the elements of the claimed invention. Here, the rejection has acknowledged that Baukal teaches introducing “a second oxygen containing gas 15 into a flame 13 via conduit.” Final Office Action at page 3. Additionally, the rejection has acknowledged that Brandvold does not disclose that the air introduced at tuyeres 24e is used for additional combustion. Final Office Action at page 4. That conclusion adheres to the finding of the Board of Patent Appeals and Interferences, which declared in its Finding of Fact No. 5 that

Brandvold does not disclose any particular stoichiometric condition of the fuel and air mixture supplied to heating means, nor does Brandvold disclose that the air introduced at tuyeres 24e is used for additional combustion.

Decision on Appeal 2009-003198 dated January 19, 2010, at page 9 (emphasis added). The proposed combination of Brandvold and Baukal therefore fails to expressly disclose “introducing additional combustion air through an opening in a wall of the rotary vessel at a location downstream, relative to a kiln gas stream, of the flame” as required by the claims.

When Applicants pointed out that deficiency in the Interview of October 13, 2010, the Examiner asserted Brandvold *inherently* taught the limitation of “introducing additional combustion air” because the air introduced at tuyeres 24e would perform a combustion function. See Examiner’s Interview Summary dated October 19, 2010, lines 6-7. However, the rejection has not set forth the evidence or analysis necessary to show that the cooling air introduced at tuyeres 24e would inherently have a combustive effect. As such, the analysis set forth in the Final Office Action is deficient and does not properly support a rejection under 35 U.S.C. § 103(a).

The law is clear that, absent an explicit teaching in Brandvold, the rejection must satisfy a high burden under 35 U.S.C. § 103(a) to establish inherency. Citing Federal Circuit precedent, the MPEP states that “[t]he fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic.” MPEP § 2112.IV (citing *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ 2d 1955, 1957 (Fed. Cir. 1993)) (emphasis in original). The burden is on the examiner to provide the technical reasoning and extrinsic evidence necessary “to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.” MPEP § 2112.IV (quoting *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)) (emphasis in original). Indeed, “[t]o establish inherency, the extrinsic evidence ‘must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.’” MPEP § 2112.IV (quoting *In re Robertson*, 169 F.3d 743, 745, 49 USPQ 2d 1949, 1950-51 (Fed. Cir. 1999)) (citations omitted). Here, the rejection has failed to provide any extrinsic evidence or analysis to show that the cooling air introduced through tuyeres 24e would necessarily perform a combustion function.

The Office Action contains literally no support for the rejection’s assertion that the air introduced at tuyeres 24e would perform a combustion function, and Brandvold is silent regarding the combustive effect of the cooling air. Instead, Brandvold emphasizes that the cooling air introduced through tuyeres 24e is used to limit temperature in that end of the kiln. At col. 6, lines 55-60, Brandvold teaches that

Cooling means 24 (FIGS. 1, 3) communicating with the drying zone DZ mixes a cooling fluid, such as ambient air, with the heated fluid to limit the temperature in the drying zone DZ below about 700.degree. F. so that the raw material pellets 10 will not explode due to rapid heating to a deleteriously higher temperature about 700.degree. F.

(emphasis added). Perhaps, as the Examiner suggests, the cooling air may also have a combustive effect; however, it is equally possible that the cooling air may not have a combustion function, particularly given that Brandvold emphasizes that the air has a cooling effect and ensures that “the raw material pellets 10 will not explode due to rapid heating.” Brandvold’s

disclosure is simply silent as to the possible combustion function performed by the cooling air, and the rejection has not provided the additional analysis or evidence to show that the cooling air would necessarily perform a combustion function. In the absence of any additional analysis or evidence, Applicants respectfully assert that the rejection has failed to show that Brandvold inherently discloses introducing additional combustion air.

For that reason, the rejection has not established that the combination of Brandvold and Baukal discloses expressly or inherently “introducing additional combustion air through an opening in a wall of the rotary vessel at a location downstream, relative to a kiln gas stream, of the flame” as required by the claims. Indeed, the rejection has put forth no evidence, extrinsic or intrinsic, that makes “clear that the missing descriptive matter is necessarily present” in the references. *See In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). Such evidence or analysis would seem particularly important where, as here, the Board has already found that Brandvold does not “disclose that the air introduced at tuyeres 24e is used for additional combustion.” In the absence of such evidence, the rejection has not satisfied the evidentiary burden and is therefore based on a flawed analysis of the scope and content of the prior art. Applicants therefore ask that the rejection of claims 1-7, 9-12, and 14-18 be withdrawn.

(ii) *The references teach away from the proposed modification.*

Applicants respectfully maintain that Baukal teaches away from “introducing additional combustion air through an opening in a wall of the rotary vessel at a location downstream, relative to a kiln gas stream, of the flame” and is limited to injecting additional air directly into the flame. As such, a person of ordinary skill, with Baukal and Brandvold before them, would not find the subject matter of the claims obvious, and Applicants therefore respectfully ask that the rejection of claims 1-7, 9-12, and 14-18 be withdrawn.

*KSR Int’l. v. Teleflex* reaffirmed that certain principles govern the analysis of obviousness. *See* 550 U.S. 398 (2007). The *KSR* Court emphasized the “principle that when the prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be nonobvious.” *KSR*, 550 U.S. at 416 (citing *U.S. v. Adams*, 383 U.S. 39, 51-52 (1966)). In applying this principle, any analysis of obviousness must consider the prior art “in its entirety, i.e., as a whole, including portions that would lead away

from the claimed invention.” *W.L. Gore & Assoc. v. Garlock*, 721 F.2d 1540, 1550-51 (Fed. Cir. 1983) (emphasis added). In this case, Baukal specifically requires introducing a secondary oxygen stream directly into the flame, not at a location downstream from the flame as required by claims 1-7, 9-12, and 14-18.

Even if a person of ordinary skill were to implement Baukal’s teachings in Brandvold’s kiln, a person of ordinary skill would not locate Baukal’s secondary oxygen stream downstream of the flame. Instead, a person of ordinary skill would follow Baukal’s teaching set forth at col. 4, lines 36-46, which states:

It also has been found that by injecting oxygen directly into a specific region of the visible flame, the amount of NO<sub>x</sub> formed is equal to or less than that produced by a burner operating on air with an equivalent stoichiometric amount of oxygen. This means that the benefits of oxygen enriched combustion, one of which is reduced flue gas volume, can be achieved at NO<sub>x</sub> levels below those of conventional air-based burners. The location of oxygen introduction into the flame is critical, and test furnace experiments later described showed that the oxygen must be introduced directly into the visible flame at a distance x, where x is measured from the burner discharge point in an axial direction, such that x/L is at least about 0.3, L being the total length of the visible flame produced by the burner as measured from the burner discharge point to the tip of the flame. The upper limit of x/L is about 0.8, beyond which NO<sub>x</sub> formation begins to increase above that of conventional air-based burners.

(emphasis added). At col. 5, lines 37-47, Baukal further emphasizes that

While the relative location[s] of burner 1 and injection conduit 17 are not critical to the invention, it is critical that the oxygen-containing gas be injected directly into the flame as shown for example in FIG. 1, such that there is minimal intermixing of the injected gas with the furnace gases surrounding the flame. Thus the term direct injection as used in the present specification means that there is minimal or essentially no mixing between the injected gas and the surrounding furnace gases.

(emphasis added). In other words, Baukal expressly teaches that its system will not function if the secondary oxygen stream is not introduced directly into the visible flame. Given that teaching, no one skilled in the art would be motivated to make the claimed invention from the proposed combination because Baukal teaches that the resulting device would simply have not worked.

When Baukal's disclosure is properly considered "in its entirety, *i.e., as a whole*, including portions that would lead away from the claimed invention," Applicants respectfully submit that a person of ordinary skill would be led away from introducing additional combustion air "at a location downstream, relative to a kiln gas stream, of the flame" as required by amended claims 1-7, 9-12, and 14-18. Indeed, a person of ordinary skill would instead follow the emphatic teaching of Baukal that "it is critical that the oxygen-containing gas be injected directly into the flame." For that reason, Applicants respectfully believe that a person of ordinary skill would be led away from the claimed invention, and Applicants respectfully ask that the rejection of claims 1-7, 9-12, and 14-18 be withdrawn.

**Re: claims 8 and 13**

Claims 8 and 13 depend from claim 7. As discussed herein, Applicants believe that the amended claim 7 is not obvious under Section 103. Applicants therefore ask that the rejection of claims 8 and 13 should be withdrawn for at least the reasons hereinbefore discussed with regard to claim 7. See *In re Fine*, 837 F.2d 1071, 1076 (Fed. Cir. 1988) ("Dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious."). Additionally, claims 8 and 13 require the introduction of additional combustion air at a location within the calcining zone of the rotary vessel. Applicants respectfully submit that Brandvold and Baukal that both references teach away from the claimed method and therefore do not render the claimed method obvious.

At col. 6, lines 55-75, Brandvold specifically teaches and requires introducing additional air in the drying zone at the upper end of the kiln. Baukal, on the other hand, specifically requires introducing a secondary oxygen stream directly into the flame at the lower end of the kiln. As such, the proposed combination fails to teach introducing additional combustion air at a location with the calcining zone of the kiln and, more importantly, Baukal and Brandvold appear to teach away from introducing additional combustion air at a location within the calcining zone. For those additional reasons, a person of ordinary skill would be led away from the claimed invention, and Applicants ask that the rejection of claims 8 and 13 be withdrawn.

**Request of the Applicants**

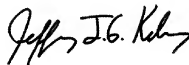
As requested by the Examiner, Applicants have prepared these Remarks in order to present in greater detail the arguments outlined in the Interview of October 13, 2010. In the event that the Examiner has any additional questions related to this response in particular, or to the application in general, the undersigned would appreciate the opportunity to address those questions directly in a telephone interview to expedite the prosecution of this application for all concerned.

**Conclusion**

In view of the foregoing remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants hereby solicit to action to that end.

Applicants further respectfully ask the Office to consider this paper a Petition for an Extension of Time sufficient to effect a timely response and ask that shortages in other fees be charged or any overpayment in fees be credited to the Account of Barnes & Thornburg, Deposit Account No. 10-0435, with reference to file 204560-73806.

Respectfully submitted,  
BARNES & THORNBURG LLP



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